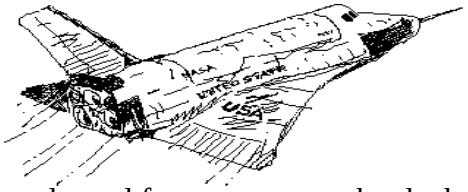
Title: Shuttle Control



Brief Overview:

Students will be asked to design a control panel for a new space shuttle that will be launched in the year 2000. They will use a variety of polygons and be expected to determine area. This unit will help students develop a positive attitude toward mathematics and appreciate the role of mathematics in school, culture, and society.

Link to Standards:

- **Problem Solving** Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.
- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and signs, symbols, and terms of the discipline.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.
- **Estimation & Computation** Students will demonstrate their ability to apply estimation strategies in computation, with the use of technology, in measurement, and in problem solving. They will demonstrate the reasonableness of solutions. Use calculators as appropriate.
- **Geometry** Students will demonstrate and apply concepts of measurement using non-standard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem solving situations.

Grade/Level:

Grades 4-5

Duration/Length:

Approximately 4 class periods, 45 minutes to 1 hour each .

Prerequisite Knowledge:

Students should know how to do the following:

- Identify the parts of a letter
- Recognize and construct a variety of polygons

- Estimate the area of polygons by counting squares on grid paper
- Represent distance by scale
- Construct a graph

Objectives:

Students will demonstrate their ability to:

- work cooperatively in groups.
- use estimation skills.
- construct polygons within predetermined dimensions.
- write a persuasive letter.

Materials/Resources/Printed Materials:

- Ruler
- Calculator
- Student Work Packet
- Extra copies of Student Resource 2 (may be needed for making individual panel designs on day 2)
- Teacher Resource - Copy of "Ickle Me, Pickle Me, Tickle Me Too" from Where the Sidewalk Ends by Shel Silverstein

Development/Procedures:

Day 1:

- Read the poem "Ickle Me, Pickle Me, Tickle Me Too" to students. Discuss the difference a control panel would have made on their voyage. Students will break into groups and brainstorm ideas for a control panel that would have helped Ickle Me. (For example, a compass, fuel gauge, wind gauge, etc.)

Day 2:

- Students will share their ideas for the design of a new control panel. Distribute Student Work Packets to all of the students. Working in groups, they will begin activities 1 and 2. Students may choose to draw a "group" design or select one of the designs of the members of the group.

Day 3:

- Students will complete activities 1, 2, and 3.

Day 4:

- Each student will write a letter to NASA to persuade them to select his/her panel control design. Students will use the writing process to complete activity 4.

Performance Assessment:

- Group participation
- Informal teacher observations of students at work
- Scoring rubric for Activity 4:

4 Points:

- Written work is clearly presented with supporting details; has correct form, spelling, punctuation, and grammar
- Demonstrates logical reasoning
- Contains correct computation of area and scale
- Has accurate graph construction
- Polygons are drawn correctly

3 Points:

- Contains three of the above criteria

2 Points:

- Contains two of the above

1 Point:

- Contains one or none of the above

Extension/Follow Up:

1. Field trip to Goddard Space Center in Greenbelt, Maryland or to the Air and Space Museum in Washington, DC
2. CD ROM discs -- "World View", "Space Exploration"
3. Use graphics programs such as Logowriter, Microsoft Draw, Micro World Project Builder, or Claris Works to construct a model of your control panel

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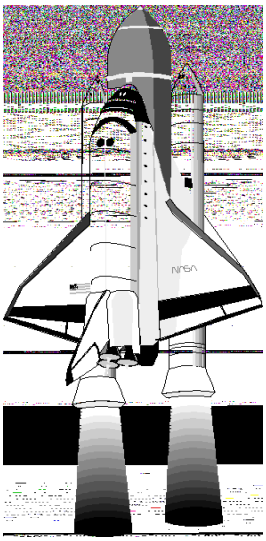
STUDENT WORK PACKET

Name_____ Date_____

Activity 1

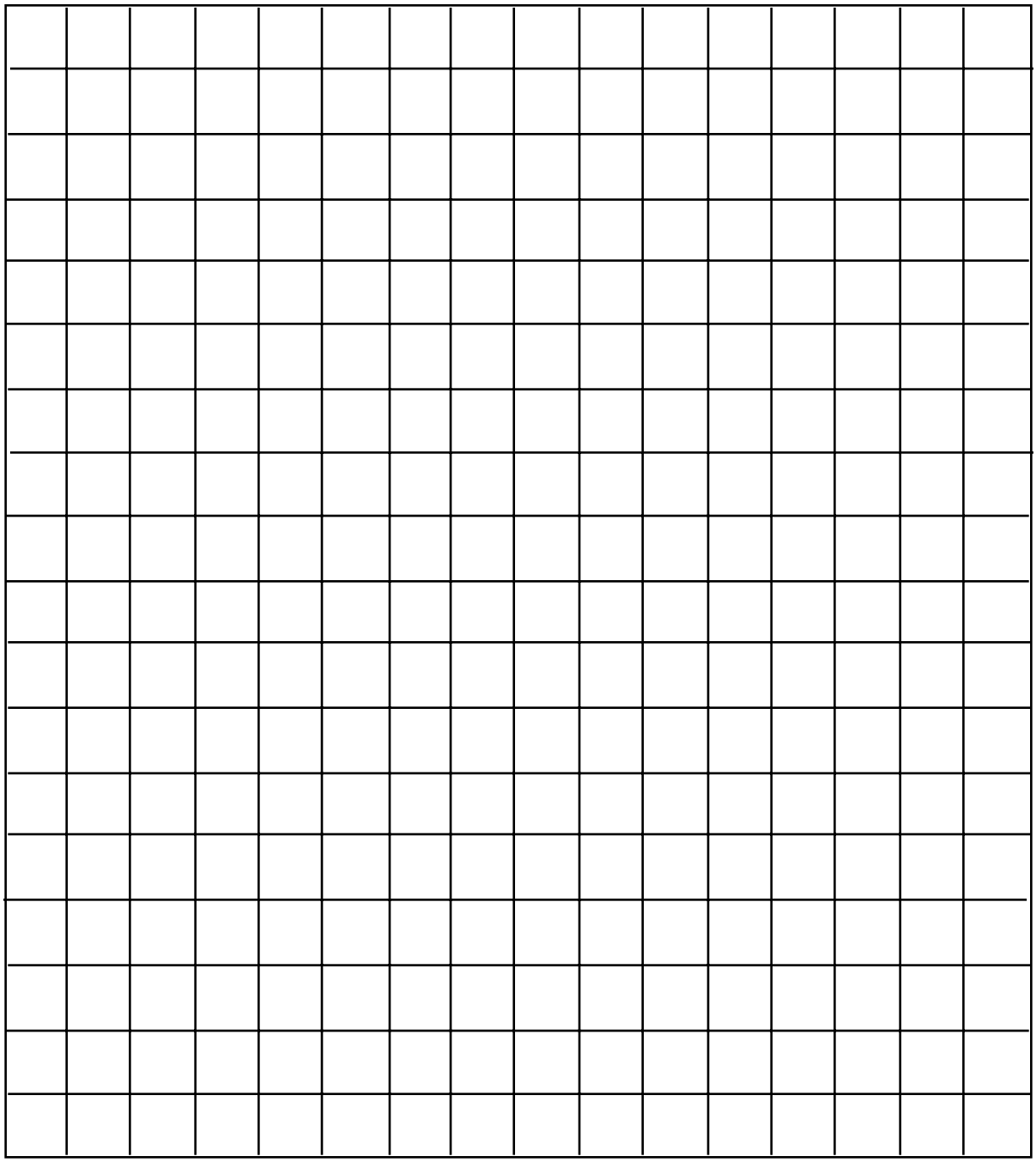
NASA wants to build a replacement for the space shuttle. The old control panel needs to be redesigned. Your school has been asked to submit a design for the new panel. The panel must fit in an area that measures 2 meters across and 3 meters high. You may select shapes from the polygon sample sheet (Resource #6) or use other polygons. Try to include as many functions as possible on your panel. You may only use polygons for your gauges, controls, switches, and monitors. Use as many different polygons as you can in your design. Before you begin to design your control panel, (Activity 2), develop a scale to represent the 2 meter by 3 meter limitation. For example, 1 cm block = 10 cm on the control panel. Use the space below for your planning.



Activity 2

Use this centimeter graph paper to create the scale drawing of your control panel.

CENTIMETER GRAPH PAPER



Activity 3

Use complete sentences to answer the questions about your control panel design.

A. What is the area of each polygon? (Measured in square centimeters) Explain how you got your answer.

B. What is the area that is not taken up by the polygons on the control panel?

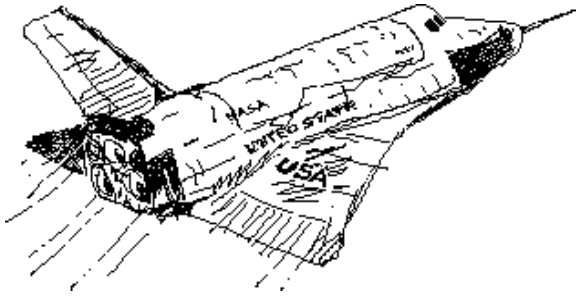
C. Write a number sentence to compare the answers you got in questions A and B.

D. Explain what shuttle functions can be controlled, operated, or monitored at this panel.

E. Can more than one astronaut work at this panel? Explain.

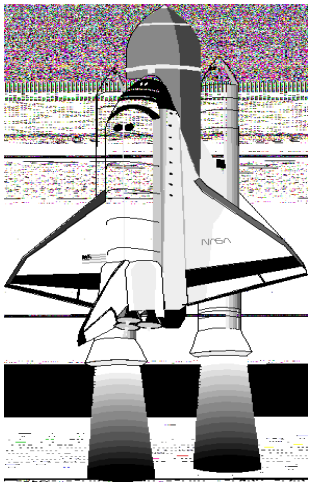
F. Explain why you chose the polygons in your design.

Activity 3 continued
Develop a graph to show how many times each type of polygon was used in your control panel. Be sure to include all the components of a graph.



Activity 4 Shuttle Control Student Resource #5

Write a letter to persuade NASA engineers to select your control design for the new space shuttle design. Your letter should include why you chose your polygons, how you used the space allotted, and how the panel can be used by the astronauts. Be sure your letter includes all the parts of a letter.



Sample Polygons